CLAIMS

What we claim is:

1. A method for converting natural gas to an olefin,. comprising:

a) providing a stream of natural gas;

b) separating the natural gas stream into a feed stream and a burn stream;

c) conveying the feed stream and burn stream to a furnace wherein the burn stream is burned and wherein the feed stream is heated to form hydrogen and reactive products comprising an acetylene portion;

d) quenching the reactive products and hydrogen; and

e) conveying the reactive products to a catalytic reactor and providing hydrogen and a catalyst in the reactor such that the reactive products are converted to the olefin.

2. The method of claim 1 wherein the pressure of the natural gas stream is between about 1 bar and about 20 bars.

3. The method of claim 1 wherein in step b) the feed stream is heated to a temperature in the range from about 1000 K to about 1800 K.

4. The method of claim 3 wherein the feed stream is maintained at a temperature of at least 1000 K for less than 100 milliseconds.

5. The method of claim 1 wherein the catalyst in the catalytic reactor is selected from the group of catalysts consisting of nickel-boride, metallic paladium, a bimetallic catalyst, and palladium with a group 1b metal.

6. The method of claim 1 wherein the temperature in the catalytic reactor is in the range from about 300 K to about 1000 K.

7. The method of claim 1 wherein the olefin is ethylene.

8. A method for converting natural gas to an olefin, comprising:

a) providing a stream of natural gas;

b) conveying the natural gas to a reactor and heating the natural gas using electrical power, wherein the natural gas is heated to form hydrogen and reactive products comprising an acetylene portion;

c) quenching the reactive products and hydrogen;

d) conveying the reactive products and hydrogen to a catalytic reactor; and

e) providing hydrogen and a catalyst in the reactor such that the reactive products are converted to the olefin.

9. The method of claim 8 wherein in step b) the electrical power employs an electrical arc, resistance heating a plasma reactor, a fuel cell or a combined cycle gas turbine drive electrical generator.

10. The method of claim 8 wherein the pressure of the natural gas stream is between about 1 bar and about 20 bars.

11. The method of claim 8 wherein in step b) the feed stream is heated to a temperature in the range from about 1000 K to about 1800 K.

12. The method of claim 8 wherein the feed stream is maintained at a temperature of at least 1000 K for less than 100 milliseconds.

13. The method of claim 8 wherein the catalyst in the catalytic reactor is selected from the group of catalysts consisting of nickel-boride, metallic paladium, a bimetallic catalyst, and palladium with a group 1b metal.

14. The method of claim 1 wherein the temperature in the catalytic reactor is in the range from about 300 K to about 1000 K.

15. A method for converting natural gas to an olefin,. comprising:

a) providing a stream of natural gas;

b) conveying the natural gas through a furnace wherein hydrogen is burned and wherein the natural gas is heated to form hydrogen and reactive products comprising an acetylene portion;

c) quenching the reactive products and hydrogen; and

d) conveying the reactive products to a catalytic reactor and providing hydrogen and a catalyst in the reactor such that the reactive products are converted to the olefin.

16. The method of claim 15 wherein the pressure of the natural gas stream is between about 1 bar and about 20 bars.

17. The method of claim 15 wherein in step b) the feed stream is heated to a temperature in the range from about 1000 K to about 1800 K.

18. The method of claim 15 wherein the feed stream is maintained at a temperature of at least 1000 K for less than 100 milliseconds.

19. The method of claim 15 wherein the catalyst in the catalytic reactor is selected from the group of catalysts consisting of nickel-boride, metallic paladium, a bimetallic catalyst, and palladium with a group 1b metal.

20. The method of claim 15 wherein the temperature in the catalytic reactor is in the range from about 300 K to about 1000 K.